Namba, Valerie

From: Mike Cudahy [mikec@cmservnet.com]
Sent: Thursday, November 29, 2007 1:14 PM
To: Namba, Valerie; Walls, Dave
Cc: Richard W Church; Jeff Church; Kelley Taber
Subject: PPFA - comment on PEX NOP
Attachments: 11-29-07_PPFA_PEX_NOP_Comments.pdf

Dave and Valerie,

Attached is PPFA's official comments on the California State NOP for PEX.

Let me know you have received the submittal in good condition.

Also let me know if you want a fax version. Since this document contains color photos, I suspect you would rather not have it faxed.

Michael Cudahy
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November 30, 2007

VIA FACSIMILE & ELECTRONIC MAIL

Ms. Valerie Namba
California Department of General Services,
Real Estate Services Division
Professional Services Branch,
Environmental Services Division
707 Third Street, Suite 3-400
West Sacramento, CA 95606

Re: Notice of Preparation of EIR for Adoption of Statewide Regulations Allowing Use of PEX Tubing

Dear Ms. Namba:

The Plastic Pipe and Fittings Association (PPFA) is pleased to submit comments on the Notice of Preparation (NOP) for an EIR evaluating the proposed adoption of statewide regulations for PEX piping. As a trade organization representing manufacturers of PEX piping, PPFA has significant technical expertise and knowledge of plastic piping systems. PPFA and its members have devoted substantial resources to studying the issues identified in the NOP. There is ample evidence that PEX is equivalent to or superior to other code-approved materials, and the State can be assured that there is no potential for a significant impact to the environment or human health from the installation or use of PEX piping.

I. Nature and Use of PEX

PEX is a commonly used material in California as well as nation- and worldwide. PEX already is approved in all of the model codes (Uniform Plumbing Code (UPC), International Plumbing Code (IPC) and National Standard Plumbing Code (NSPC)) in the United States. PEX is allowed for use in California in residential construction as an alternate material subject to local approval on a case-by-case basis. (Health & Saf. Code, § 17951(e); Cal. Plumbing Code, 25 Cal. Code Regs. § 14.) PEX also is authorized for use in the 49 other United States and throughout the world.

PEX pipe has been used successfully in potable water applications, radiant heating applications, and snow melt systems throughout Europe for over 35 years, and it has been used successfully for the same applications (and many more) throughout the United States and Canada for over 20 years. In many local jurisdictions in California, such as the Highland area, Santa Clarita, Redding, Chula Vista, and Village of Lakes, PEX tubing was approved locally for potable water applications, dating back to the early and mid 1990's, specifically to address the rampant failure of copper systems. PEX tubing has performed without failure in these locations after more than 10 years of continuous service, far surpassing the life achieved by the original copper plumbing.

Information obtained from the National Association of Home Builders and other sources suggests that presently 80% or more of new residential construction in California uses PEX. The fact that PEX tubing has performed successfully for such an extended period of time in multiple countries, under conditions of widely varied water chemistries and water treatment practices, empirically demonstrates that PEX tubing is capable of performing as well as, or better, than every other plumbing material currently approved for use in the State of California.

Notwithstanding the popularity and success of PEX tubing, labor unions in California have consistently fought the full adoption of PEX into the code. Over the years many claims have been raised about the durability and effects of PEX. These comments address those claims and the issues identified in the NOP.

Potential for Premature Failure: Comments on prior code adoption cycles have claimed that PEX is susceptible to attack by oxidants and can be damaged by exposure to ultraviolet radiation and thus could fail prematurely. There is simply no evidence that these are risks associated with PEX.

The proposed regulations would permit expanded use of PEX for delivery of potable water. The primary "oxidant" in drinking water is chlorine used for water treatment. Unlike metallic pipe, PEX is tested for oxidative failure by a stringent ASTM[1] standard: ASTM F 2023, Standard Test Method for Evaluating the Oxidative Resistance of Cross-Linked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water. ASTM F 2023 was specifically developed to assure that PEX can withstand oxidation by chlorine. The gradual oxidation of PEX due to ultraviolet light rays and oxygen is a well-understood chemical process similar to the oxidative degradation of metal plumbing components (though the process typically occurs much more slowly in PEX). All PEX manufacturers account for the effects of oxidation through engineered additive packages and selective antioxidant blending. PEX pipe is engineered to perform well beyond the typical life expectancy for potable water systems, precisely because the oxidation mechanism is so well understood. As a result, PEX pipe can be expected to last 50 to 100

[1] ASTM is a not-for-profit standards development organization that provides a forum for the development of consensus standards for materials, products, systems and services. For more information see http://www.astm.org.

years, which is as good or better than all other pipe materials in use and on par with the average life of a building.

Excessive exposure to ultraviolet radiation is known to be detrimental to some plastic pipes. Accordingly, PEX is specially packaged and specific instructions are given by the manufacturers as to acceptable exposures based on the type, color and/or composition of the pipe.

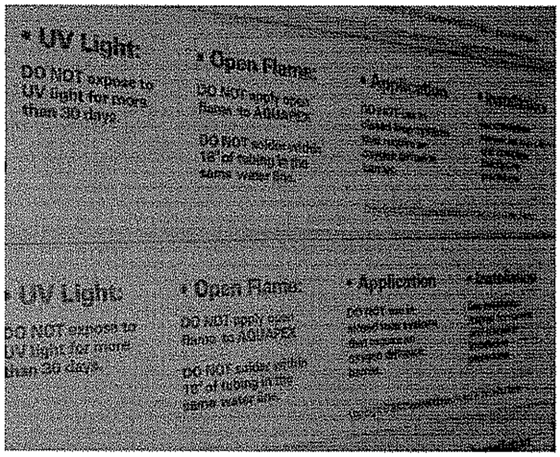


Photo: Outside of a PEX box with instructions

Because PEX is installed in enclosed areas, there is no risk of damage from UV exposure.

When considering the potential for material failure, it is important to note that, contrary to prior allegations about PEX, PEX is not polybutylene (PB) pipe. There is no physical relationship between PEX and PB systems. PEX is an improved version of polyethylene, which has been used in pipe systems for decades. PEX is a higher performance version of polyethylene, given additional toughness, melt resistance and other properties by a cross-linking process. Substantial technical detail regarding the science behind the materials used to stabilize PEX pipe is provided in the report by Professor Michael R. Hoffmann, Ph.D., (See "Analysis of PEX and Drinking Water Supplies Relative to the UPC of California," Prof. Michael R. Hoffmann, Ph. D. Caltech, at pp. 7-17.)

On a molecular level, the materials are unique in many ways, resulting in appreciable differences in material behavior. Polyethylenes are classified according to density: low, medium, and high. PEX tubing is made from high-density polyethylene (HDPE), providing considerably higher tensile strength than that observed in low and medium-density polyethylene. High molecular weight HDPE offers outstanding toughness and durability, particularly at low temperatures, due to a unique combination of average molecular weights ranging from 250,000-500,000 and a bimodal molecular weight distribution. Cross-linking HDPE by chemical or irradiation treatment (the processes used to create PEX pipe) transforms the material into a thermoset, with outstanding heat resistance, chemical resistance, and strength. The degree of crystallinity is much lower in

PB, and PB is not cross-linked. Since mechanical properties vary with the type and degree of crystallinity and cross-linking, these two polymers exhibit significant differences in tensile, flexural, and impact strength as well differences in thermal stability. (Basics of Design Engineering – Engineering Materials – Plastic Properties – Polyolefins; http://www.machinedesign.com/BDE/materials/bdemat2/bdemat2_21.html.)

Common PEX SDR-9 pipe is 20% thicker than the PB (SDR-11) pipe and is tested for chlorine resistance by ASTM F2023 to have a life of at least 50 years. PEX uses improved fitting systems made to ASTM standards. PEX is tested to higher temperatures than PB. Polyethylene, the basic polymer for PEX has been used for decades for pipe applications. See Differences Between PEX and PB Piping Systems for Potable Water Applications TN-31/2004, Plastic Pipe Institute (PPI) 1825 Connecticut Ave., NW, Suite 680, Washington, DC 20009 www.plasticpipe.org for more information.

To illustrate just one of the remarkable advantages of cross-linking, here are before and after photos of two PEX tubes (upper left white and right with blue stripe) resisting a hot plate temperature of about 440 F while PE pipe (black center), a "lead free" solder (melts at 441 F) and a traditional leaded solder (361 F) all melt.

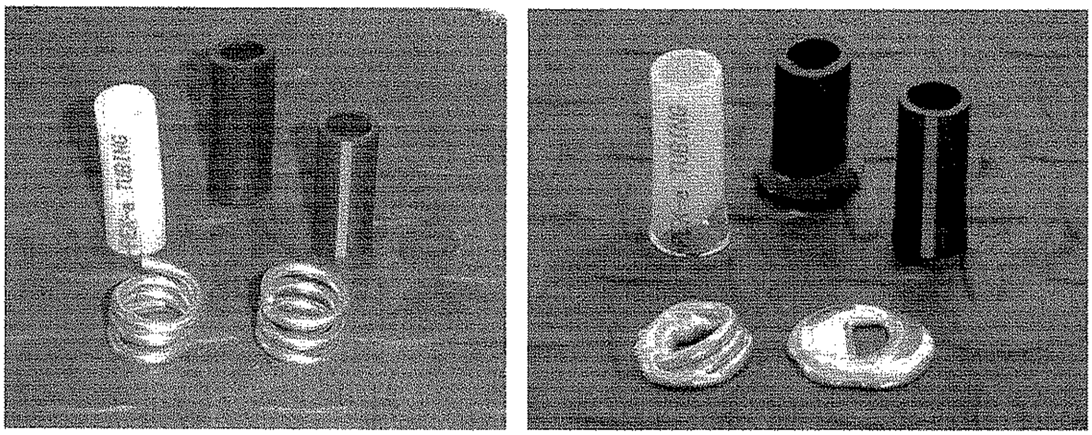


Photo: Example of crosslink behavior – heat resistance

PEX opponents have asserted that acidic water accelerates chlorine attack on PEX. Again, these opponents do not have science on their side. PEX is tested to high levels of chlorine exposure. It is actually copper failures and corrosion that are increased by the presence of acidic water. California's water is known to be aggressive enough in places to eat through metal pipe in under a year. In these areas, plastic pipe is the obvious choice. PEX is tested in an environment that is 2.4 times more aggressive than one of the most aggressive potable water environments in the United States, providing confidence that PEX will function at least as well (and likely better than) alternative pipe materials currently approved for use in the California. Copper pipe, which currently is the most commonly used pipe material in California, has been known to fail in a matter of months in water with a pH of 6.5, regardless of oxidation-reduction potential (ORP). In fact, copper corrosion in low-pH water is so well documented that the National Sanitation Foundation (NSF) does not even both to test copper at pH levels less than 6.5

Opponents of PEX have implied that mechanical failure of PEX produces catastrophic failure, which is alleged to lead to water damage, possible black mold and at least temporarily rendering the dwelling uninhabitable. This is more unfounded conjecture. There is no evidence of unusual or widespread failures of PEX in more than 20 years of use in the U.S. and more than 30 years of use in Europe. Pinhole leaks in copper pipes behind walls have occurred in many regions, however, and this has certainly caused the growth of mold.

In the past, opponents of PEX have attempted to scare regulators from approving PEX in California by raising the specter of massive PEX failures in Washington State. Those failures refer to one lot of one type of PEX – UltraPEX lot 7 pipe made from a single resin source that failed in several applications – in distribution, hydronic applications and where firestopping was in contact with the material. Those failures were plainly attributable to the defective lot of that particular pipe and are not relevant to the PEX industry as a whole. In fact, a very small number of failures were reported in Washington (less than 60). All were confined to a relatively small region of Washington State. All failed tubing was produced by a single manufacturer (who is no longer in business), from one specific resin, from a single production lot.

Of course, all commonly used plumbing materials, such as plastics, copper or steel, will eventually fail, either by age or corrosion. In some regions, the nature of the soil or water will cause premature mechanical failing of metal pipe – in a time span of only a few years or even less -- requiring expensive re-piping. In fact, high chlorine, high flow velocities, high dissolved gases, aggressive waters, aggressive soils or improper use of flux and low pH all can cause copper pipe to fail prematurely.

It is widely documented that copper plumbing pipe has experienced an increase in both the number and frequency of premature failures during the past 40 years. Numerous newspaper and trade publications have reported that recently installed copper pipe has failed in as little as two years in multiple states, including California. As a specific example, consider the rampant failure of copper pipe in Village of Lakes, California, referred to by others as the "Village of Leaks" ("CPVC Water Supply Tubing," Timothy Allinson, Plumbing Engineer, November 2004). According to an article published in Plumbing Engineer (reference previously cited article written by Timothy Allinson), 250 homes in this community were re-piped 750 times in a span of 8 years to due recurrent pin hole leaks in copper tubing.

Similar cases of rampant copper failures have occurred in numerous other California communities as well, including (though not limited to) Highland, Santa Clarita, Chula Vista, and Redding. It is significant that the copper pipe mentioned was not "defective" or unusual, but simply could not withstand the conditions in which it was installed. Clearly, the multiple large-scale copper pipe failures in California and elsewhere have demonstrated a far more troubling and costly failure history than the isolated PEX situation highlighted by PEX opponents. In comparison to the performance history of other potable pipe materials currently approved for use in California, PEX has consistently stood out as a superior material.

Make no mistake – failure of a pressurized water distribution system can pose a significant loss of property to a homeowner, regardless of pipe material. Citizens of California who have been forced to re-pipe their home with copper are well aware of this. Re-piping with rigid pipe will always prove more difficult and cause more extensive piping work than using a flexible product such as PEX. Flexible pipe is less expensive to install and requires less intrusive work inside existing walls. Re-piping with a material that has already failed prematurely is irrational.

II. Environmental Issues to Be Addressed in the EIR

Recognizing the benefits of PEX piping, California has attempted several times to amend the California Plumbing Code to make it consistent with the Uniform Plumbing Code and permit the unrestricted use of PEX. Each time PEX opponents with a vested economic interest in preventing the unrestricted use of PEX submitted negative comments and unsupported allegations about potential impacts of PEX. The specific issues identified in the NOP as potential effects of PEX appear to reflect many of those prior comments. A careful examination of the available scientific evidence demonstrates that there is no truth to any of the prior allegations. Rather, the evidence shows that PEX is equivalent to or superior to other code-approved building materials and poses no risk of significant adverse impacts to the environment or human health.

A. Water Quality

Comments on prior code adoption cycles have alleged that PEX pipe could leach organic compounds, including leaching from byproducts of anti-oxidants used in the pipes, exposure to ground pollution and permeation by termiticides. These allegations are unfounded. Dr. Hoffman has addressed each of the allegations in the previously cited report.

Moreover, all water pipe materials, including PEX and metal pipe, must meet the requirements of NSF/ANSI-61, "Drinking water system components health effects," a national, consensus, independent health effects standard that tests for known or suspected contaminants that might extract (leach) from the pipe into the water flowing through it. Compliance with NSF standards provides assurance that PEX will not present a significant risk of harm to human health or the environment.

Interestingly, the only relevant caveat for "inside-the-building" water piping is for copper. Copper piping cannot be tested to the full range of waters as can plastic, as acidic water will dissolve copper into the water in excess of the allowable health limits. This leaching behavior of copper tube is dependant on the water supply and can occur in tubing of any age. We are not aware of any attempt to remove copper tube from the code based on the possibility that excessive copper can contaminate drinking water, although it is notable that jurisdictions in California have banned the use of copper for these reasons.

Byproducts of anti-oxidants used in the pipes: Dr. Hoffman's analysis addresses antioxidants used to protect PEX piping. Dr. Hoffman compares the similarities between plastic drinking water bottles, which are widely used throughout California and the world, with PEX pipe and concludes that there is no basis for concern about leaching and stabilizers. Dr. Hoffman's report finds that under extreme conditions, plastic materials (i.e. HDPE, PET, PC, PEX, PVC, etc.) can release chemical compounds at detectable level to various solvents, including water. However, even at the maximum release rates observed for HDPE, PET, PC, and PEX plastics, there is no evidence of any health or safety risks either to human health or to the health of the environment.

Exposure to ground pollution: Since PEX is a cross linked form of high density polyethylene (HDPE), and cross linking reduces the potential of migration of organic compounds, PEX has fewer issues with permeation then PE pipes already in use. (See Hoffman report at pp. 18-22.)

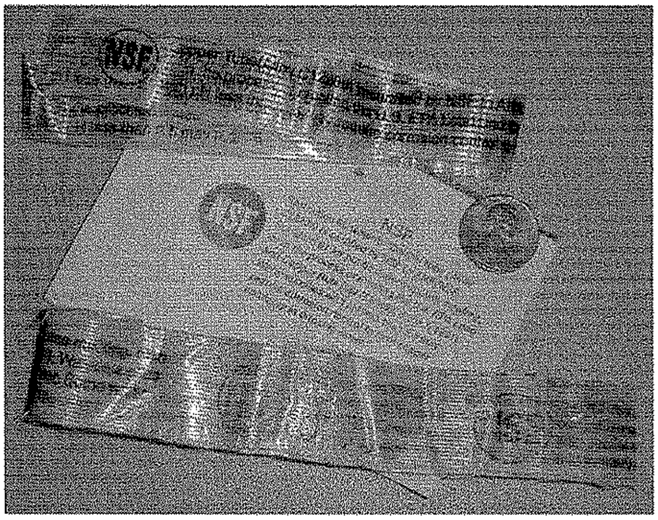
Termiticides permeation: Dr. Hoffman provides one example of a termiticide (Bifenthrin) that would biodegrade first before passing through an unusually ***thin*** 0.2 mm PEX pipe wall in an estimated 2,800 years. (See Hoffman report at pp. 22-23.) We are not aware of any presently approved piping material that is expected to be in service for 2,800 years.

PEX opponents have made much of an Arizona lawsuit against PEX manufacturer Wirsbo, suggesting that the very existence of a lawsuit demonstrates a "high" risk of permeation from MTBE or MTBE as a byproduct of PEX production. These allegations are discussed and refuted in Dr. Hoffman's paper.

MTBE Leaching: NSF testing has demonstrated that if MTBE or TBA is emitted from PEX pipe at all, they are detected in only very small concentrations immediately after manufacturing, and they dissipate to a non-detectable level in a matter of days in potable water. In a typical installation, simply flushing the potable water system 1-2 weeks after installation similar to the requirement for CPVC pipe should eliminate any possible taste or odor concerns associated with the PEX tubing.

Common sense would suggest that all plumbing systems should be flushed prior to use, to ensure that any residues from oils, solders, chemical fluxes, char and other undesirable animal or other tramp materials are removed. Again, copper tube can exceed health limits in drinking water on occasion, and not just immediately after manufacturing, but years later. We do not believe copper should be removed from the code because of this.

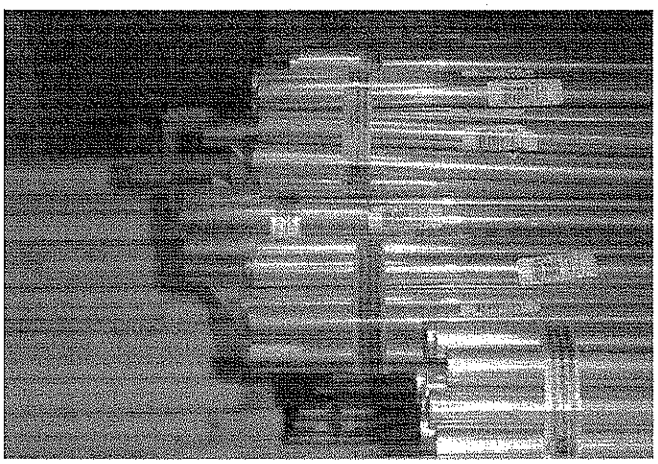
NSF's third party testing is widely accepted for all types of plumbing materials and components – including copper tube. The only plumbing material currently in use that requires special treatment of any kind is, in fact, copper tube, which when listed to NSF/ANSI 61 requires a tag or marking on a bundle of pipe that states a warning:



NSF Restriction Statement:

Copper tube is certified by NSF to ANSI/NSF Standard 61 for public water supplies meeting, or in the process of meeting the U.S. EPA Lead and Copper Rule. Water supplies with pH less than 6.5 may require corrosion control to limit copper solubility in drinking water.

Photo: NSF limitation tags for copper tube bundles



This warning, found attached to bundles of copper tubing, is intended to protect the public from excessive dissolved copper in the drinking water that can occur under these conditions. Obviously, if the pipe is corroding – the copper is entering the drinking water and the environment.

Photo: NSF limitation marking on copper tube bundles

B. Solid Waste

Comments on prior code adoption cycles have claimed that PEX is susceptible to attack by oxidants and can be damaged by exposure to ultraviolet radiation and thus could fail prematurely. While premature failure of any piping material could eventually lead to increased landfill disposal, as discussed in section I, above, there is simply no evidence that premature failure is a risk of PEX. PEX pipe can be expected to last 50 to 100 years, which is as good or better than all other pipe materials in use and on par with the average life of a building.

With regard to recycling issues, as an initial matter, the EIR should reflect that the manufacture, installation, use, collection, disposal and recycling of any material will have impacts on the environment – and this most certainly includes metal products. While turning used PEX pipe into new PEX pipe is unlikely, the shear volume of similar plastics in short lived applications (packaging, bottles, food protection, etc.) makes this argument much less relevant. Packaging that might last a few weeks vs. 50+ years of service for pipe is a significant difference in application. We do, however, expect increased recycling over time for all materials. PEX producers are establishing markets for reground scrap materials, and some are able to sell scrap material for other uses, such as composite lumber used in decking and fences as well as filler in cement and asphalt.

While the secondary recycling of copper is an established business, it is not, as one would imagine, a completely environmentally benign process. When alloys of copper, brass and bronze are smelted down to produce secondary copper, a dust is created that contains lead, cadmium, zinc and numerous other heavy metals. Recycling of copper also requires significant energy. Life cycle analysis suggest that making copper tube from recycled materials still uses more energy than making plastic pipes.

The price of scrap copper – related to demand for the metal, has risen so high in recent years that the practice of "snipping" or stealing the metal from new construction is a serious problem. Thieves can do thousands of dollars worth of damage to collect $50 worth of scrap copper pipe and wire. There have been serious flood damage, fires and even gas explosions resulting from the theft of copper from buildings.

C. Air Quality

PEX is joined with mechanical fittings. Torches, glues and grinders are not used during installation. PPFA cannot imagine what possible air impacts there would be from the installation or use of PEX piping.

Regarding the potential for toxic smoke from PEX tubing in the event of fires, the combustion products of PEX are water, CO and CO2. The amount of PEX tubing in any structure would be very small relative to the total structure and its contents, many of which (including carpeting, electronics, chemicals, etc.) could be expected to produce toxic gases if burned. Any contribution from PEX piping would be insignificant.

Finally, it is notable that PEX weighs substantially less than a code-approved alternative, copper piping. For example, ¾" PEX is 2.9 to 5.7 times lighter in weight than an equal length of the various weights of copper tubing, reducing transportation and other environmental impacts. As a result, it is reasonable to expect significant savings in fuel consumption, and truck emissions from the transport of PEX piping to the marketplace and construction sites, all of which should result in improved air quality through the use of PEX relative to heavier metal pipes.

D. Public Health

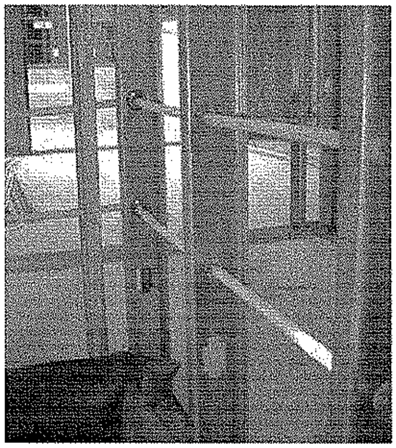
Biofilm formation: We are unaware of any evidence that PEX may promote the growth of the Legionella pathogen. Regarding biofilm formation in general, it is not uncommon for hot water tanks to exhibit thick biofilms in the bottom of the tank after 2-3 years of use, regardless of the pipe material in the installation. Such biofilms are typically comprised of a consortium of microorganisms, and pathogenic species may or may not be present. One cannot assume that the mere presence of a biofilm indicates that water quality has been negatively impacted.

Further, the "thickness" of a biofilm (or the microbial count) again tells us nothing about the impact (or lack thereof) on water quality. Biofilms on wetted surfaces can become quite thick without altering the bulk microbial content of water contained by the wetted surfaces, and many biofilms contain few (if any) pathogens. This is particularly true for potable water applications, where the water entering the system has been treated to remove pathogenic microorganisms and where residual disinfectant is typically present.

Many microorganisms prefer to attach themselves to the pipe wall (regardless of pipe material) rather than to float freely in the water, as doing so provides the microorganism greater access to nutrients than would otherwise be available. While this typically promotes biofilm formation, it does not typically result in significant changes to the number of microorganisms in the bulk water.

There is no evidence that PEX piping presents any greater risk to human health or water quality from biofilm formation than any other code-approved material. The study, "Microbiology, chemistry and biofilm development in a pilot drinking water distribution system with copper and plastic pipes," (Markku J. Lehtolaa, et al.) indicates that copper can resist biofilms for short to medium lengths of time – but after 200 days, the advantage is gone. As houses and the associated plumbing can be used for 30 to 100 years, copper's short-term resistance to organic film is meaningless. To quote the report, "The formation of biofilm was slower in copper pipes than in the PE pipes, but after 200 days there was no difference in microbial numbers between the pipe materials. Copper ion led to lower microbial numbers in water during the first 200 days, but thereafter there were *no differences* between the two pipe materials." (Emphasis added.) To the extent copper offers superior short-term resistance to biofilms, it is due to the toxicity of the metal, which presents its own issues in terms of water quality and human health impacts.

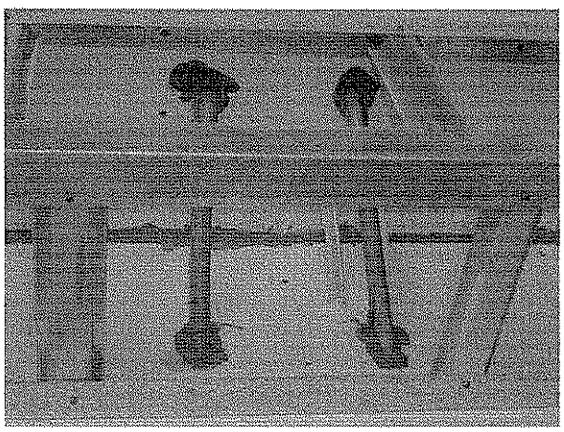
Fire Hazards: PEX opponents have contended that openings in wall studs may encourage fire spread in the event the PEX pipe burns away during a fire. This is a red herring. All pipes installed through wall studs, and all wires for that matter, already pass through holes larger than themselves. They must - in order to avoid damage. Steel studs already have factory cuts in them, as can be seen below. Wall studs are not the issue.

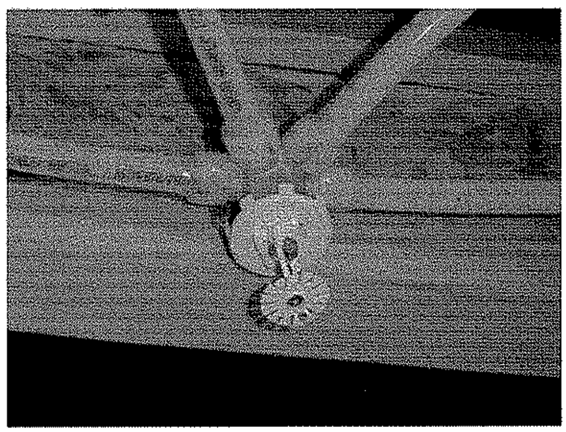


The important consideration is that all penetrations through fire-rated walls are required to use technologies to prevent "de-rating" or lowering the resistance of the firewall to fire. Chapter 15 of the Uniform Plumbing Code (UPC), "Firestop Protection," clearly covers firestopping for all pipe materials – non-combustible and combustible - metallic and plastic. There are no issues with regards to fire safety not covered in the model code. Metal pipes are to be insulated to prevent them from becoming so hot they defeat the fire rating and ignite materials on the other side. All pipes are protected with intumescent devices and caulking that prevents flame from passing through any gaps in rated walls or partitions.

Photo: Common steel studs used in construction

Since California already approves other plastic pipe materials, such as CPVC, PE, PVC and PEX for many uses, the obvious implication is that this firestopping issue is not a concern.





Photos: PEX pipe with firestopping and a PEX residential sprinkler system

Simply put, firestop products are now mandatory and are required by all model building codes. Firestop products can play a significant part in reducing the number of lives and property lost due unnecessarily to the rapid spread of fire and smoke. Firestop products work by filling the voids around penetrating items in fire rated walls and floors. Some firestop products intumesce, or expand, in the presence of heat. The intumescing action seals the penetration and stops the spread of flames and smoke to other floors and rooms.

A firestop system consists of a fire rated wall or floor, a penetrating item (pipe, cable, conduit, etc.) and the firestop sealant. Only the total firestop *system* is tested and listed by Underwriters Laboratories, Inc., (UL), Underwriters Laboratories of Canada (ULC) and/or Warnock Hersey (WHI), not just the firestop product alone.

Fire Rated Assemblies for PEX	UL System #
CONCRETE FLOORS	C-AJ-2119 C-AJ-2176 C-AJ-2494 F-A-2171 F-A-8033
WOOD FLOORS	F-C-2013 F-C-2192* F-C-2298 F-C-2329 F-C-8007 F-C-8015 F-C-8039 F-C-8087
GYPSUM OR CONCRETE WALLS	W-L-2007 W-J-2001 W-L-2104 W-J-2025 W-L-2121 W-J-2035 W-L-2209 W-L-2262 W-J-2122 W-L-2342 W-L-2373 W-J-2142 W-L-2402 W-J-2162 W-L-2457 W-J-2197
GYPSUM SHAFT WALLS	W-L-2430 W-J-2180

** incorrectly deleted by UL, pending reinstatement*

It is not uncommon to come across an application combination in which no UL system exists. In such cases, a manufacturer may be able to supply Certified Installation Instructions for that application.

Several tests have been designed to rate the performance of firestop products. One of the most important tests is ASTM E-814, *"Fire Tests of Through – Penetration Firestops."* In addition, UL has developed UL 1479, "Fire Tests of Through – Penetration Firestops," and UL 2079 for construction joints, to evaluate the performance of firestop systems.

Good websites for information on firestopping include: www.metacaulk.com. The systems described above can been seen by code number at this link: http://www.metacaulk.com/ulsystems.htm.

PEX is also joined with mechanical fittings - eliminating installation fire risk. Unlike with copper, propane torches are not used to install PEX pipe. The risk of fire associated with torches should be obvious, whether in new construction, or in the repair of old soldered pipe. Newer lead-free solders, with 80 F higher melting points then the previous leaded solders, would be expected to increase the risk of charring.

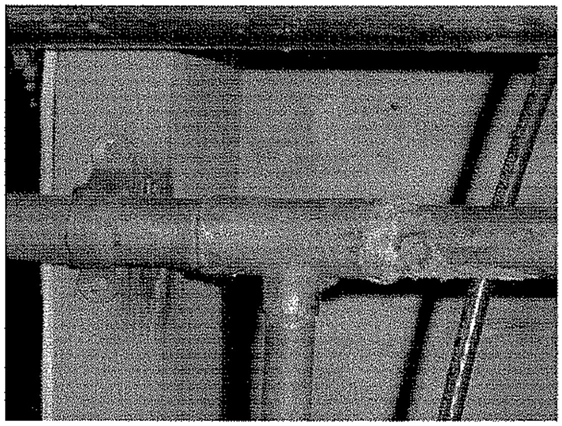


Photo: Note char on nearby combustible framing with copper

Past comments also have expressed concern for firestopping of PEX pipes when exposed to seismic activity. This concern will obviously apply to firestopping for all systems -- both metal and plastic pipes. It is a reasonable assumption that flexible and lightweight plastic pipes would better withstand any adverse effects of seismic activity better than heavier, rigid pipes.

In fact, full statewide approval of PEX would certainly increase the implementation of PEX residential fire sprinkler systems in the state. PEX pipe is suitable for use in household fire sprinkler systems and can be UL rated to this application. While these residential sprinklers are not mandated by code, the lower cost of PEX systems would encourage their installation. This in turn would *reduce* residential fire risks in California, not increase them.

E. Water Supply and Energy Use

There is substantial evidence that increased use of PEX will have a beneficial impact by resulting in significant savings in water use and energy consumption. The advantages for PEX pipes go well beyond just their lower heat conductivity. PEX CTS tube, made to SDR-9 has a thicker wall than copper tube – meaning a similar sized pipe will insulate better and contain a lower volume of water. Because PEX is flexible, less expensive, and less time consuming to install than copper, more intricate energy and water saving designs become cost effective. A national "big box" hardware store recently had 10' lengths of ¾" type L copper tube priced at $32.03 and 100' spools of ¾" PEX priced at $45.76. This is an incredible 85% savings when choosing PEX over copper. Estimates for the installation of a PEX system versus copper can be a third of the time for a similar design.

Since the economics of PEX is conducive to producing designs that can include features from traditional trunk and branch, home run (direct manifold piping to individual fixtures) or remote manifold systems, energy (and water) saving systems can be designed to better fit the application. PEX can also withstand higher flow velocities with hot water that would erode copper tube. Copper is not recommended for velocities exceeding 5 ft/second in applications with hot water. All of these inherent benefits allow PEX systems to get hot water to the consumer faster than other systems, with less wasted purge water from the hot lines and less wasted energy from hot water left in the lines after use.

A study carried out for the California Energy Commission: on various hot water distribution systems ("Evaluation of Residential Hot Water Distribution Systems by Numeric Simulation," Final Report – March 2004, Robert Wendt, et al.) provides ample evidence that plastic pipes will save California citizens money, energy, water and even time. Report findings for policy makers included:

- Remove barriers to the use of CPVC and PEX piping when appropriate quality and durability can be demonstrated.

- Consider ways to encourage installation of demand recirculation and parallel pipe systems [common with PEX], when warranted.

An example table (Table A-5 House #2 attached) from the report shows how various pipe systems perform. The table shows data for a "cold draw" where hot water is demanded at a tap or fixture from a cold line. PEX systems (the last two rows of data) show significant - up to 60% - savings over even insulated copper for energy and wasted water. Obviously, PEX and PEX pipe layouts can be designed to save California significant resources over even insulated copper.

It is also critical to realize that with long lived products directly involved in energy and material intensive applications such as hot water distribution pipes, the majority of the environmental impact is not from manufacture or recycling, but the actual use phase of the product. Water heating can account for 14%–25% of the total energy consumed in the home. The U.S. Department of Energy estimates that the average household uses 64 gallons of hot water a day. Consider that in a 50-year span of time that use exceeds a million gallons of heated water. The potential to save up to 600,000 gallons of heated water, and the energy involved in treating, distributing, heating and, ultimately, disposing, of that water, is a significant benefit of PEX. This is in addition to the simple savings of purged water from using smaller pipes.

It is for these reasons that PEX systems are getting "points" in Green Building systems for their energy and water savings features such as the United States Green

Building Council's LEED-H, the California based "Build It Green," National Association of Home Builder's "National Green Building Standard" and others.

F. Alternatives

The No Project Alternative may well lead to increased use of copper pipe throughout California. The preceding comments have identified many ways in which copper piping could cause relatively greater environmental impacts than PEX. Water quality concerns are especially significant impacts of the use of copper piping for water distribution.

Copper ions are well known to act as poisons to both plants and animals. As water corrodes copper, it enters the environment. Common sources of copper reaching the California bay have included copper sulfate root killer, which was banned in December 1995 in California for this reason, (see California EPA News Release (C-63-95) and the corrosion products of copper plumbing. California agencies, in attempts to reduce copper from entering San Francisco Bay, have made recommendations to not use copper in new construction, to approve plastic pipe for use and in one case, banned copper from DWV (Drain Waste and Vent) applications. (See "Copper Piping Corrosion: A Problem for San Francisco Bay," Feb 1997 Palo Alto Regional Water Quality Control Plant and "Preventing Corrosion Protects San Francisco Bay," 2003, Bay Area Clean Water Agencies.)

The EIR prepared by the State of California, Department of Housing and Community Development for the adoption of regulations allowing the statewide use of CPVC piping (November 2006, State Clearinghouse No. 2006012044) contains substantial evidence of the harms associated with the use of copper piping. The discussion of the No Project Alternative in the PEX EIR should include the evidence from the CPVC Recirculated Draft EIR (RDEIR) relative to the following topics:

RDEIR pp. 34-35 and Appendix D: Emissions (discussing toxics and carcinogenic smoke and vapors from soldering).

RDEIR pp.107-120: Section 4.3.1.2 re. Current Copper Use (discussing leaching, corrosion, blue water, pipe failures and one to four year life span areas for copper).

RDEIR pp. 134-139: Section 4.4.1.2 re. Current Copper Use (discussing toxic fumes, improper installation of copper).

RDEIR pp. 155-156: Section 4.5.1.1, Current Copper Use (showing that copper is left in place and not always ripped out and recycled, i.e., the same as for plastic piping).

RDEIR pp. 165-168: Water Quality (showing that plastic pipe [CPVC] is superior to copper) and Safety (same).

RDEIR pp. 218-220: (demonstrating that plastic pipe [CPVC] saves water and energy when compared to copper).

IV. Conclusion

Obviously, PEX should be a product of choice for all Californians. PEX is a proven, safe, durable and economical pipe material with ANSI/NSF-61 certification. It has as long a history of use as other common materials, and PEX is as good or better than currently accepted materials. There is simply no evidence that PEX will result in significant adverse impacts to the environment or human health, and in fact, there is substantial evidence that full PEX adoption can save Californians money, energy and water. Further delay of adopting PEX only serves to goals of a very limited economic interest group and is bad for California.

We would be pleased to answer any technical questions or provide additional information regarding PEX. Please contact PPFA at mikec@cmservnet.com with any questions. Thank you.

Very truly yours,

Richard W. Church

Richard W. Church
Executive Director

RWC/jlp

cc: David Walls, Executive Director
California Building Standards Commission

Table: Hot water distribution systems energy and water conservation

Table A-5 House #2 - Monthly Water and Energy Waste (Cold Start Draw Cycle)

House-2	Wait Time for HW (Sec.)			Water Wasted	Energy Loss Btu) From		Water Cost ($)	Energy Cost ($)	
	Min	Typical	Max	(gallons)	Previously Heated Water Wasted	Pipe	Wasted Water	Electric	Gas
Conv Attic Cu - Central	18	35	98	789	466,673	46,409	0.90	19.75	6.17
Conv Attic CPVC - Central	17	34	94	765	452,432	23,852	0.87	18.33	5.72
Conv Attic Cu	10	49	171	1,111	657,210	62,495	1.26	27.71	8.65
Conv Attic Cu-Ins	10	49	171	1,111	657,210	63,592	1.26	27.75	8.67
Conv Attic CPVC	10	48	164	1,070	633,075	31,211	1.22	25.56	7.98
Conv Attic CPVC-Ins	10	48	164	1,070	633,075	31,466	1.22	25.57	7.99
Conv CS Cu	10	50	173	1,123	664,106	72,095	1.28	28.35	8.85
Conv CS Cu-Ins	10	50	173	1,129	667,854	71,267	1.28	28.46	8.89
Conv CS CPVC	10	49	166	1,080	638,546	34,997	1.23	25.92	8.09
Conv CS CPVC-Ins	10	49	166	1,080	638,546	34,782	1.23	25.91	8.09
Conv Slab Cu	10	52	189	1,198	708,555	135,721	1.36	32.54	10.16
Conv Slab Cu-Ins	10	50	173	1,123	664,106	99,622	1.28	29.42	9.19
Conv Slab CPVC	10	49	168	1,089	644,018	40,728	1.24	26.35	8.23
Conv Slab CPVC-Ins	10	49	168	1,088	643,643	36,349	1.24	26.17	8.17
Demand Recir Attic Cu *	6	8	49	241	142,640	91,988	0.27	9.07	2.83
Demand Recir Slab Cu *	5	8	52	246	145,564	200,882	0.28	13.44	4.20
Demand Recir Attic CPVC *	6	9	48	245	144,889	43,292	0.28	7.26	2.27
Demand Recir Slab CPVC *	6	9	52	256	151,560	65,263	0.29	8.37	2.62
Parallel Attic PEX	9	21	52	382	225,916	27,880	0.43	9.77	3.05
Parallel Slab PEX	9	21	56	394	232,887	36,675	0.45	10.39	3.24

NOTES:
* Energy supplied to the demand recirculation system pump is calculated as 2.62 kWh/year or 0.22 kWh/month, which equals approximately $0.02/month. This cost should be added to energy cost figures in the last two columns above to get the total energy cost.

Example table from **Evaluation of Residential Hot Water Distribution Systems by Numeric Simulation**

Cu =copper tube, Cu Ins = insulated copper tube, CPVC = Chlorinated Polyvinylchloride pipe, PEX = PEX pipe
Attic = pipe runs overhead, Slab = pipe runs underground, CS = pipe runs "between" floors